**WE CLAIM:**

1. A receiver optical sub-assembly (ROSA) for mounting in a host opto-electronic device comprising:

an optical coupler for receiving an optical signal from an optical waveguide along an optical axis;

a photodiode disposed along the optical axis for receiving the optical signal and for converting the optical signal into an electrical current signal;

an amplifier for converting the electrical current signal into a differential voltage signal, having the photodiode mounted thereon;

a substrate, a first surface of which is connected to the optical coupler, and a second surface of which supports the amplifier, whereby the optical signal travels from the first surface through the substrate to the photodiode mounted on the amplifier;

an electrical connector connected to the second surface for electrically connecting the amplifier to the host opto-electronic device.

2. The ROSA according to claim 1, further comprising a lens positioned between the optical coupler and the photodiode.

3. The ROSA according to claim 2, wherein the second surface of the substrate includes a cavity; wherein the photodiode is mounted on the amplifier; and wherein the amplifier is mounted on the second surface of the substrate at positions around the cavity with the photodiode extending into the cavity.

4. The ROSA according to claim 3, wherein the cavity contains a material with an index of refraction similar to that of the lens.

5. The ROSA according to claim 3, wherein the photodiode is a rear-illuminated photodiode with electrical contacts on a front face thereof; wherein the front face of the photodiode is bonded to a

mounting surface of the amplifier; and wherein the mounting surface of the amplifier includes electrical contacts in electrical contact with corresponding electrical contacts of the photodiode.

6. The ROSA according to claim 5, wherein the amplifier includes a redistribution layer mounted on the mounting surface for electrically connecting the photodiode contacts with the amplifier contacts.

7. The ROSA according to claim 2, further comprising an index matching insert inside the optical coupler disposed between the optical waveguide and the lens having an index of refraction substantially the same as that of the fiber.

8. The ROSA according to claim 2, wherein the lens is integral with the optical coupler; and wherein the substrate is transparent to the optical signal.

9. The ROSA according to claim 2, wherein the substrate comprises a first semi-conductor micro-bench; and wherein the lens is formed in the first surface of the first semiconductor micro-bench.

10. The ROSA according to claim 2, wherein the substrate comprises a first semiconductor micro-bench and a second semiconductor micro-bench fixed thereto; and wherein the lens is formed in the second semiconductor micro-bench.

11. The ROSA according to claim 10, wherein the second semiconductor micro-bench includes a first set of reference elements; and

wherein the first semiconductor micro-bench includes a second set of reference elements;

whereby the first semiconductor micro-bench and the second semiconductor micro-bench are aligned during assembly by mating the first set of reference elements with the second set of reference elements.

12. The ROSA according to claim 1, wherein the electrical connector is a flexible electrical circuit connector.

13. The ROSA according to claim 12, wherein the flexible electrical circuit connector substantially covers the second surface of the substrate, except for cut-out portions in the flexible electrical circuit, which receive electrical components extending from the second surface.

14. The ROSA according to claim 12, wherein the flexible electrical circuit connector substantially covers the second surface of the substrate; wherein the photodiode extends through a hole in the flexible electrical circuit for receiving light from the optical waveguide; and wherein the amplifier is electrically connected to the flexible electrical circuit at points around the hole therein.

15. The ROSA according to claim 1, wherein the first surface of the substrate includes a third set of reference elements; and

wherein the optical coupler includes a fourth set of reference elements for mating with the third set of reference elements;

whereby the substrate and the first optical coupler are aligned during assembly by mating the third set of reference elements with the fourth set of reference elements.

16. An optical transceiver mounting in a host device comprising:

an optical connector for receiving a duplex optical connector, which includes a first fiber for transmitting an optical signal to the transceiver and a second fiber for transmitting an optical signal from the transceiver;

a transmitter optical sub-assembly (TOSA) for generating an optical signal from an electrical signal when optically coupled to the second fiber;

a receiver optical sub-assembly (ROSA) for generating an electrical signal from an optical signal when optically coupled to the first fiber;

a housing for supporting the TOSA and the ROSA;

an electronic circuit board mounted in the housing electrically connected to the TOSA and the ROSA; and

an first electrical connector for electrically connecting the electronic circuit board to the host device;

wherein the ROSA comprises:

an optical coupler for receiving the optical signal from the first fiber along an optical axis;

a photodiode disposed along the optical axis for receiving the optical signal and for converting the optical signal into an electrical current signal;

an amplifier for converting the electrical current signal into a differential voltage signal, having the photodiode mounted thereon;

a substrate, a first surface of which is connected to the optical coupler, and a second surface of which supports the amplifier, whereby the optical signal travels from the first surface through the substrate to the photodiode mounted on the amplifier; and

a second electrical connector connected to the second surface for electrically connecting the amplifier to the electronic circuit board.

17. The transceiver according to claim 16, further comprising a lens positioned between the optical coupler and the photodiode.

18. The transceiver according to claim 17, wherein the second surface of the substrate includes a cavity; wherein the photodiode is attached to the amplifier; and wherein the amplifier is connected to the second surface of the first semiconductor at positions around the cavity with the photodiode extending into the cavity.

19. The transceiver according to claim 18, wherein the photodiode is a rear-illuminated photodiode with electrical contacts on a front face thereof; wherein the front face of the photodiode is bonded to a mounting surface of the amplifier; and wherein the mounting surface of the amplifier includes electrical contacts in electrical contact with corresponding electrical contacts of the photodiode.

20. The ROSA according to claim 16, wherein the first surface of the substrate includes a third set of reference elements; and

wherein the optical coupler includes a fourth set of reference elements for mating with the third set of reference elements;

whereby the substrate and the first optical coupler are aligned during assembly by mating the third set of reference elements with the fourth set of reference elements.

21. An optical sub-assembly for mounting in a host opto-electronic device and for optically coupling with an optical waveguide comprising:

an optical coupler for transmitting an optical signal between the optical waveguide and the optical sub-assembly along an optical axis;

a transducer disposed along the optical axis for converting optical signals from the waveguide into electrical current signals or for converting electrical signals from the host opto-electronic device to optical signals;

a transducer control chip for converting the electrical current signal from the transducer into a differential voltage signal or for driving the transducer to produce optical signals, wherein the transducer is mounted on the transducer control chip;

a substrate, a first surface of which is connected to the optical coupler, and a second surface of which supports the transducer control chip, whereby the optical signals travel through the substrate between the optical coupler and the transducer;

an electrical connector connected to the second surface for electrically connecting the transducer control chip to the host opto-electronic device.